

Using Computer Tomography For Locating Endolithic Organisms

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Perhaps one of the most fundamentally difficult challenges facing those who would search for life is to detect life inside minerals. The problem is further exacerbated when conditions get extreme because much of the life moves from the clement surface environment into the pores and more clement environments inside of rocks, minerals and soils. Once encased in their lithic homes, these microbes become nearly impossible to study by standard techniques because of the opacity of the rocks.

The development of x-ray imaging coupled to computerized tomography is a well known technique that has been used by the medical profession for many years. In brief, CT is an imaging tool combining the concept of a standard x-ray device (source and detector) with a mechanism for taking "slices" of the sample, and using a computer to reconstruct these data in two or three dimensions.

We have now used several different CT systems, beginning with the medical scanners for the detection of layered communities in sandstone rocks from Antarctica. Even this crude instrument was able to point to the areas of the rock that were dominated by microbial populations – this provides the critical first information where to search for life signature with other methods. We have shown that without sample preparation or destruction it was possible to locate area inside the rock where microorganisms are present. A new type of instruments with resolution 5-8 micron allowed us to image the internal structure of minerals and obtain 3D images of inclusions or fossils inside rocks.